Vectors

Optional: Look up the formal definition of a vector (has nothing to do with magnitude or direction).

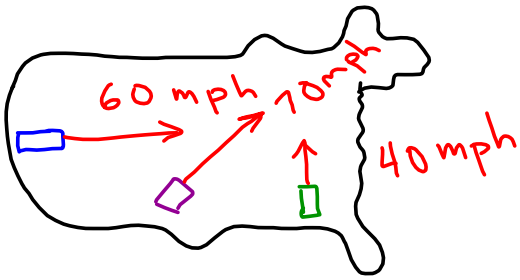
Working definition of a vector (for intro physics): an object with magnitude and direction. Can be represented by arrows.

magnitude: 20 cm

direction: down & right

magnitude: 31 cm

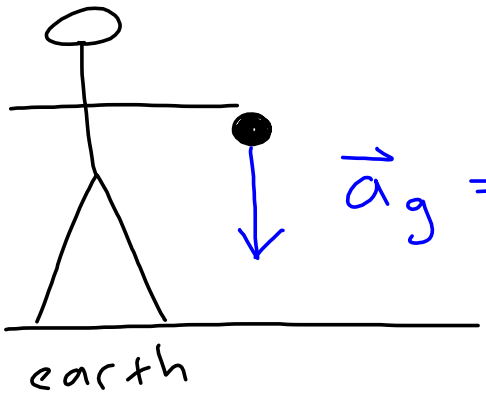
direction: left



$\vec{V}_G$ = 40mph, north

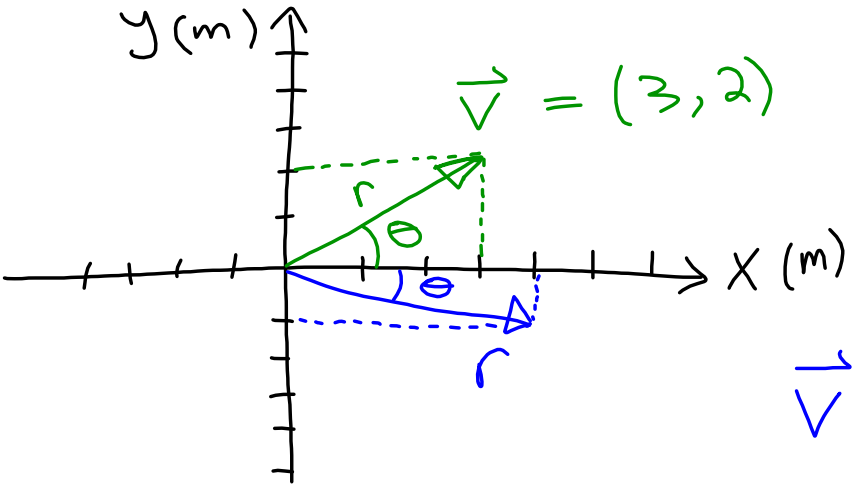
$\vec{V}_B$ = 60mph, east

$\vec{V}_p$ = 70mph, north-east



$\vec{a}_g = 9.8 \frac{m}{s^2}$, down

sec. 3.1 – coordinate systems



$\vec{v} = (3, 2)$

$\vec{v} = (4, -1)$

(x-coord. of vector tip, y-coord. of vector tip)

↳ tail of vector starts at origin

Any vector can be expressed in an infinite number of ways.

(1) x, y (see above)

(2) r, θ

$r = \sqrt{x^2 + y^2}$

$\theta = \arctan\left(\frac{y}{x}\right)$

$x = r\cos\theta$

$y = r\sin\theta$

Aside:

$\tan^{-1} \neq \frac{1}{\tan}$

$\tan^{-1}$ = inverse tangent = arctan

* be careful, e.g. $\text{atan}\left(\frac{3}{2}\right) = \text{atan}\left(\frac{-3}{-2}\right)$

tip: use $\text{atan2}(y, x)$

$\text{atan}\left(\frac{-7}{5}\right) = \text{atan}\left(\frac{7}{-5}\right)$

Sec. 3.2 - Scalars vs. Vectors

↳ see above

regular number

e.g. 5

$\pi = 3.14159\ldots$

7.4

physics examples: mass
time
temperature